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CONTRIBUTIONS FROM H. M. GORDIN.

I. THE ASSAY OF CRUDE DRUGS.

The first step in the alkaloidal assay of drugs and galenical preparations consists in the extraction of the alkaloids from these sources. The exactness of such an assay will depend in the first place upon the completeness of exhaustion of the respective sources, and in the second place upon the exactness of the method which is employed for the estimation of the isolated alkaloids. With regard to this estimation, the method which I proposed some time ago[1] seems to work very well with all alkaloids except those which are not precipitated by Mayer's or Wagner's reagents in very dilute solutions (coniine), or those that are only precipitated by these reagents in presence of a very large excess of acid (colchicine).[2] In applying this method to the assay of drugs, it is often found that upon addition of the above-mentioned reagents the precipitate obstinately refuses to separate out even upon prolonged shaking. In such cases the addition of a little talcum powder, which of course must be perfectly neutral, and a little shaking will speedily throw down all the precipitate, leaving a perfectly transparent supernatant liquid. The error in titration which is liable to arise from the addition of the talcum is probably so small that it can safely be neglected. Should very exact results be desired, this error can be entirely eliminated by standardizing the acid and alkali with the same alkaloid under the same conditions, *i. e.*, with the use

[1] *Ber. d. Deutsch. Chem. Ges.*, 1899, 2872 ; *Pharm. Arch.*, Vol. II, No. 10.
[2] *Ibid.*

of an equal amount of talcum. In this way the final estimation of the isolated alkaloid presents no difficulty whatever.

The only other condition upon which the exactness of a drug assay depends is, then, the complete extraction of the alkaloids. In the case of fluids, the complete extraction of the alkaloids presents no difficulty. By the aid of immiscible solvents we can either directly, or after a few very simple operations, separate the alkaloids from the other plant constituents with such completeness that no known reagent will show the presence of alkaloid in the exhausted liquid.[1]

But the case is entirely different with solid, not wholly soluble substances, particularly crude drugs. The complete exhaustion of crude drugs is sometimes connected with such difficulties that very often fluid extracts contain much less alkaloid than is known to be contained in the drug which the extracts are supposed to represent. It is well known, for example, that fluid extract nux vomica, as sent out by most manufacturers, contains only about 1½ per cent. of total alkaloids, whereas the drug itself generally contains from 3 to 3¼ per cent. In the Pharmacopœial directions for making fluid extracts we are told to continue the percolation till the drug is exhausted. But how are we to know when the drug is exhausted? That the absence of appreciable quantities of alkaloid in a few drops of the percolate is not sufficient proof of complete exhaustion was shown in a previous paper,[2] in the case of colchicum. The only way to prove the completeness of exhaustion is to test the dregs qualitatively for alkaloids. This can be easily accomplished by removing the dregs from the percolator, drying them and then digesting a few hours with Prollius' fluid. After filtering and shaking out with acid water, the presence or absence of alkaloidal matter can be ascertained by means of the general alkaloidal reagents.

If this method of testing the completeness of exhaustion be applied to many of the methods which have been proposed for the extraction of alkaloids for assay purposes, it will be found that most of these methods are very far from securing complete exhaustion.

[1] The great exactness of separation by immiscible solvents can be deduced from a formula given in Ostwald's "Analytische Chemie."

[2] Gordin and Prescott. Paper read at the meeting of the A.Ph.A., at Richmond, Va., 1900.

As we generally do not know how much alkaloid is left behind, it is impossible to introduce a proper correction in our results.

How ineffective some of the proposed methods of exhaustion are can be shown by applying the Dunstan and Short method [1] to the assay of nux vomica.

Ten grammes of dry powdered nux vomica were extracted in a Soxhlet with a mixture of alcohol and chloroform for three hours, as directed by these authors. The extract thus obtained, after passing through immiscible solvents, was assayed by the general alkalimetric method above referred to, using $\frac{N}{40}$ acid and alkali for titration and Mayer's reagent as precipitant. The dregs were then removed from the Soxhlet, dried and assayed separately by means of modified Prollius' fluid, as given later under nux vomica. The final estimation was again made by the above-mentioned alkalimetric method. In both cases, amounts representing 5 grammes of the extract and dregs respectively were taken up by 20 c.c. $\frac{N}{40}$ acid. The factor taken was the mean factor of strychnine and brucine.

EXTRACT.

$\frac{N}{40}$ acid consumed by 5 grammes, 13·5 c.c. = 2·46 per cent. total alkaloids.

DREGS.

$\frac{N}{40}$ acid consumed by 5 grammes, 2·7 c.c. = 0·49 per cent. total alkaloids.

By taking 1 gramme of talcum with definite amounts of $\frac{N}{40}$ acid, making up the liquid to 100 c.c., filtering off 50 c.c. and titrating with $\frac{N}{40}$ alkali, using phenolphtalein as indicator, I find that this amount of talcum consumes 2 c.c. $\frac{N}{40}$ acid. It is therefore best to use 1 gramme talcum in all cases where the precipitate refuses to separate out, and deduct 2 c.c. from the total amount of $\frac{N}{40}$ acid consumed by the alkaloid.

---

[1] Prescott's "Organic Analysis," 1887, 456.

We see that by Dunstan and Short's method we only extract about 83 per cent. of the total alkaloids.

In order to select the best method of extraction among the great number proposed for that purpose, the custom has generally been to make comparative assays of one and the same drug by different methods and give that method the preference which gives the highest results. This way of establishing the correctness of a method is certainly not without faults. It is not the high results we want, but the true results. Just as some faulty features of a method are liable to give results below the truth, there are others which might give results above the truth. The explanation of a method giving too low results is easily found by admitting that either the extraction is not complete or the operations of the method involve a loss of some alkaloid. The cause of too high results is not so easily found, but a method should not be adopted unless it be shown that it gives exact results, or at least approaches the truth nearer than any other method.

Now, it is certainly possible to work out for every drug a method which will have this quality. Such a method might be too tedious, too expensive, and too complicated for general use. But such a method could be used as a standard with which simpler and quicker methods could be compared. If it can be shown that the standard method gives the most exact results obtainable at the present state of our knowledge and that among the many simpler methods a particular one gives results which approach those obtained by the standard method better than any other method, that particular method should be chosen for general use. Any other method giving either higher or lower results than the standard method should be rejected. How to find such a standard method I shall try to show in the case of a few drugs only, but the principles can be extended to any other drug.

The necessary and sufficient demands which should be put to a standard method are :

(1) That the exhaustion should be so complete that no alkaloid could be found in about 5 grammes of the dregs by the method explained above.

(2) The operations involved in the standard method should only be such as are not liable to injure the alkaloid under consideration. Heat strong acids or strong alkali and prolonged exposure to the

air should therefore be avoided as much as possible. As it is impossible to exhaust some drugs like nux vomica, ipecac and cinchona without the use of acids, only very dilute acids should be used.

The standard method might vary from drug to drug, but in no case shall any method be adopted as a standard unless it possesses the above-mentioned features. As we have to admit that a method which gives good results upon one sample of a drug will give equally good results with any other sample of the same drug, provided the samples are in the same condition of fineness, etc., we can establish by means of the standard method the actual amount of alkaloid in a given drug as exactly as it is possible at present, and then try different expedient methods until we find one which, being simple and expedient, gives results which are the same or very nearly the same as those obtained by the standard method. Should there not be such a simple method, we can adopt any desirable method and introduce a definite correction into our results.

With these principles in mind, I started to apply the ideas here developed to a few of the more important medicinal drugs. Among the drugs chosen, some are very easily affected by strong reagents, but easily exhaustable (coca), others are quite stable in presence of reagents but are very difficult to exhaust (nux vomica), and again others are both easily affected and difficultly exhausted (ipecac). As my intention was not to compare most of the proposed methods with each other, but only to find one among them which gives results approaching sufficiently near those of the standard, I shall not record a large number of experiments with many methods which proved not to answer the above requirement, but shall give briefly the positive results and how they were obtained. In every case I first established a standard method and then tried to find a suitable substitute for this method. Should any other more expedient method be found, it might easily be adopted, providing its results are not far from those of the standard.

The most expedient seem to me to be the following two methods, which I shall call method A and method B. As one or the other of these two methods has given very good results as compared with the standard method in the case of the drugs tried, I have not considered any other method, but it is possible that in the case of other drugs some other method might give results even more concordant with those obtained with the standard method.

METHOD A.

Ten grammes of the drug in No. 60 powder are put into a Dunstan and Short apparatus,[1] and extracted with alcohol (95 per cent.) for about three to four hours on the asbestos plate. Most of the alcohol is then distilled off from a water-bath, and when the extract is reduced to about 10 c.c., it is cooled and diluted with water containing about 1–2 per cent. sulphuric acid. The liquid is then poured into a 50 c.c. or a 100 c.c. measuring flask, washing the vessel in which the boiling took place, and filling up the flask to the mark with acidulated water. The liquid is now shaken with a little talcum, filtered, and in 25 c.c. of the filtrate the alkaloids estimated by passing through immiscible solvents, using either ammonia or sodium hydrate for the liberation of alkaloids and either ether alone or a mixture of ether and chloroform in the right proportions to take up the alkaloids. In the case of hydrastis, a little potassium iodide is added before filling the flask up in order to remove berberine. The alkali used to liberate the alkaloid is in most cases ammonia, except in the case of cinchona, where it was found that ammonia gives rise to an emulsion, whereas sodium hydrate works very well. If a fixed alkali be used, it is necessary to shake up the ethereal solution of the alkaloid with calcined magnesia, and filter in order to remove the last traces of alkali.[2] After distilling off the ethereal liquid the alkaloids are estimated by the general alkalimetric method, referred to in the beginning of this article.

METHOD B.

This consists in digesting the drug in very fine powder with ten times its amount of Prollius' fluid modified,[3] putting the mixture into a mechanical shaker for four hours, or shaking frequently during twelve hours, drawing off an aliquot part, and shaking out with acid water. The alkaloids are then set free by ammonia, or Na-

[1] *Pharm. J.* (3), XIII, 664; Allen, "Org. Anal." 3d ed., Vol. II, Part I, page 21. This apparatus is far superior for hot extraction to the ordinary Soxhlet. The temperature of the menstruum is higher and the working of the apparatus simpler and always continuous. It is only necessary to have the menstruum boil so quickly that the drug is always covered with liquid, and to put a piece of cotton and then a heavy piece of glass, or better, a piece of lead, on top of the drug.

[2] *Arch. d. Pharm.*, 1900, 336.

[3] Lyons' "Handbook," 1899, 23.

OH, and shaken out with an immiscible solvent. The final estimation is carried out in the same way as in method A. The method B is practically the same as that given by Lyons in his "Handbook," on page 43. It differs from Keller's method in so far that no water is added for the purpose of causing the drug to ball together, and that the liquids are taken by volume, not by weight. This addition of water is certainly a source of indefinite error. Water takes up some ether and together with it some alkaloid. Besides, water itself dissolves the alkaloids to a greater or less extent. Codeine, for example, is soluble in eighty parts water, atropine in 135 parts.

But even an alkaloid which is very difficultly soluble both in water and ether is taken up to a considerable extent by water when an ether-chloroform solution of the alkaloid is shaken with water. The following experiment proves this:

0·1027 gramme strychnine was dissolved in 10 c.c. chloroform; to this solution 30 c.c. ether and 10 c.c. water was added and the whole shaken a minute or two in a separator. After a half hour's standing the perfectly clear lower aqueous layer was drawn off into a tared aluminum evaporating dish, the liquid completely removed by evaporating on the water-bath, and after drying and cooling at 125° C., the vessel again weighed. It was found that 0·0044 gramme of strychnine, or about 3 per cent. of the amount taken, was taken up by the water.

As in the assay of drugs, we very often work upon quantities containing less than 0·1 gramme alkaloid, and the quantity taken up by the water depends only upon the amount of the latter, the loss from the solubility of the alkaloid in aqueous layer is liable to be even greater.

On the other hand, the water which, in Keller's method, is added to ball the drug together, taking up some ether, diminishes the volume of the latter, so that by drawing off half the amount of the ethereal liquid originally added, either by weight or by volume, we actually get more than half of the amount originally taken, and the results will be too high. The influence of this circumstance was also proved by experiment.

0·1047 gramme strychnine was dissolved in 50 c.c. of a mixture of three parts of ether and one part chloroform; 12·5 c.c. water was now added, the mixture shaken, and after complete separation into

two layers, 25 c.c. of the upper layer was removed into a tared aluminum dish. After complete evaporation, drying at 125° C. (to remove all trace of chloroform), and weighing, 0·0564 gramme of strychnine was found to have been contained in the 25 c.c. ether-chloroform. This is more than half the amount of strychnine taken by 0·0041 gramme, or nearly 8 per cent. in excess.

As can be seen from these experiments, the error in excess is far greater than the error causing a lowering of the results. It is for this reason that Keller's method (with the addition of water) generally gives higher results than when the water is left out. This was proved by the following experiment:

(1) Fifteen grammes belladonna root in No. 80 powder were digested with 150 grammes of a mixture of three parts ether and one part chloroform for ten minutes. Ten c.c. ammonia (10 per cent.) were then added and the mixture shaken four hours in a shaker. Thirty-five c.c. water were now added, and after shaking and settling of the drug, 100 grammes (= 10 grammes drug) were drawn off and shaken out with three portions of acid water, using 50 c.c., 40 c.c. and 30 c.c. successively. The alkaloid was then shaken out with light chloroform-ether mixture and ammonia, and estimated alkalimetrically by my general method, using Wagner's reagent as precipitant.

(2) The same amount of the same drug was treated in exactly the same manner, only leaving out the addition of water.

The results obtained were as follows:

	$\frac{N}{40}$ Acid Consumed by 10 Grammes.	Percentage of Alkaloid.
(1) With water	9 c.c.	0·648
(2) Without water	7·6 c.c.	0·576

The addition of water then raised the results nearly 11 per cent. It is for this reason that in method B the addition of water was left out altogether. The ethereal layer, in most cases in my experience, separates out quite well, even without the addition of water, provided it is set aside for a sufficient length of time. In some cases the shaking up of the mixture, before drawing off the aliquot part, with about 2 grammes of calcined magnesia, will clear up the supernatant layer very quickly.

COCA LEAVES.—STANDARD METHOD.

Ten grammes in No. 60 powder were moistened in a small mortar with 5 c.c. of diluted alcohol, then placed in a small percolator, washing the mortar out repeatedly with fresh menstruum and pouring the washings on the top of the drug. Following the general rules of percolation, *i. e.*, macerating forty-eight hours, etc., the percolation was continued very slowly till about 200 c.c. of percolate were obtained. The first 10 c.c. were received into a 50 c.c. measuring flask and set aside; the balance was concentrated in vacuo, first at about 45° C., then at ordinary temperature, till reduced to about 25 c c. This was added to the reserved portion, and the whole, after washing the vessel in which the concentration took place with acidulated (2 per cent.) water, was made up with acid water to 50 c.c.

The dregs were first deprived of moisture as much as possible by forcing dry air by means of the pump through the percolator, and then thoroughly dried in desiccator. After digesting 5 grammes of the dregs a few hours with Prollius' fluid, filtering, and shaking out with acidulated water, no alkaloid could be detected either by Mayer's or Wagner's reagents.

The exhaustion being complete and no strong reagents or high heat having been used, this method of extraction was taken as a standard. The alkaloidal assay of the leaves was now carried out by filtering the acid liquid (using a little talcum), shaking out 25 c.c. (= 5 grammes drug) four times with ether and ammonia, using 30 c.c. ether each time. After distilling off the ether completely, a few drops chloroform and then 20 c.c. of $\frac{N}{40}$ acid were added, and the chloroform removed by blowing air into the flask. The estimation was then carried out by my general alkalimetric method, using Mayer's reagent as precipitant.

It was found that 5 grammes of the drug consumed 6·6 c.c. $\frac{N}{40}$ acid = 1 per cent. ether soluble alkaloids, calculated as cocaine.

The same leaves in the same state of fineness were then assayed by method A. The liquid, after distilling off the alcohol, was made up to 50 c.c. with acidulated water, filtered through talcum, and in 25 c.c. of the filtrate the amount of alkaloid estimated exactly as in the standard method.

Two assays by method A gave the following results:

Method Used.	$\frac{N}{40}$ Acid Consumed by 5 Grammes.	Percentage of Alkaloids (Ether Soluble).
Standard	6·6	1·00
A	6·5	0·988
A (duplicate)	6·6	1·00

Method A giving the same results as obtained by the standard method, and being easily carried out, this method A should be adopted for the assay of coca leaves.

HYDRASTIS CANADENSIS.—THE STANDARD METHOD.

Ten grammes of hydrastis in No. 60 powder were treated exactly as the coca leaves were treated in the standard method for that drug, but using a menstruum consisting of six volumes of alcohol, three water and one glycerin (U.S.P. menstruum for fluid extract hydrastis). The dregs, examined as described under coca leaves, were found to be free from hydrastine. The percolate was concentrated in vacuo to about 50 c.c., mixed with the reserved portion previously received into a 100 c.c. measuring flask, and after washing the vessel in which the concentration took place, diluted to 100 c.c. with water containing 2 per cent. sulphuric acid and about 5 per cent. potassium iodide. After shaking a few minutes the liquid was filtered and 20 c.c. of the filtrate (= 2 grammes of drug), after making alkaline with ammonia, shaken out three times with a mixture of three parts of ether and one part of chloroform, using 30 c.c. each time. The assay was then finished as that of coca.

The same drug in the same state of fineness was then assayed by method A, finishing exactly as in the standard method just described, *i. e.*, using potassium iodide, making up to 100 c.c., etc.

Method Used.	$\frac{N}{40}$ Acid Consumed by 2 Grammes.	Percentage of Alkaloid (Hydrastine).
Standard	7 c.c.	3·47
A	7 c.c.	3·47
A (duplicate)	7 c.c.	3·47

Method A giving such good results as compared with the standard method, A should be adopted for the assay of hydrastis in preference to all other methods.

LABORATORY OF
THE WM. S. MERRELL CHEMICAL COMPANY,
Cincinnati, O.

(*To be continued.*)

GUM MASTIC.

By Henry C. C. Maisch, Ph.D.

About a month ago there was brought to the analytical department of Hance Brothers & White a sample of mastic which was so light in color that substitution was at once suspected. On submitting it to comparative test, with other samples of the ordinary commercial variety, it was found that the several specimens were identical.

I then looked up the literature on the subject of the color of mastic and came across historical data which may prove of interest.

The species of Pistacia lentiscus is indigenous to the basin of the Mediterranean, but it is only in the island of Scio (formerly Chios) where the resin is collected and then only from a broad-leaved variety cultivated in the northern portion of this island. Orphanides has shown in 1856 that there are probably other places in the Grecian archipelago and on the Grecian mainland suitable for its cultivation. The trade in mastic was the property of the Sultan until the separation of Greece from Turkey. Twenty-two thousand oka (1,260 grammes each) were claimed as tribute, and for the balance of the crop only a small price was paid. In 1822 the island was devastated and a large number of the inhabitants killed by the Turks, and as the above arrangement could not, in consequence, be continued, the islanders obtained the privilege of selling mastic to any one, but were compelled to pay an annual tribute of 750,000 piasters, or about $2,250. Under this arrangement the lot of the planters was somewhat more agreeable, as they obtained decidedly better prices for their crops.

During May and June vertical incisions are made into the bark of the trees from which the resin slowly exudes in the form of drops or tears. These gradually harden and are collected between August and November and assorted into three kinds. The best variety consists of white or at most pale yellowish tears darkening somewhat with age. Flückiger ("Pharmacognosie des Pflanzenreichs," 3d edition, p. 115) states: "Perfectly fresh they (the tears) are of a somewhat greenish tint due to the chlorophyl of the bark; this soon disappears and is replaced by entire freedom from color, or after a longer time by a dull yellowish tint. The poorer quality is yellowish from the start." In the Pharmacographia, 2d edition, p.

164, the authors state: "They are of a pale yellow or slightly greenish tint, darkening by age, dusty and slightly opaque on the surface." Martius ("Pharmacognosie," 1832, p. 364) distinguishes several varieties and classes the seraglio mastic as the best. It was shipped principally to Constantinople for use in the Sultan's harem, but at that time appearing occasionally in European commerce. He describes this variety as appearing in "separate, white or yellowish-white, roundish tears." The tears have a glassy appearance internally and possess a peculiar balsamic odor which becomes more pronounced on heating. Mastic is aromatic, and when chewed becomes plastic, by which it is distinguished from sandarac, which remains in the form of powder.

Mastic is chewed in the Orient for perfuming the breath and whitening the teeth and is said to have the property of hardening the gums.

Bombay mastic, which occasionally appears in the market, is an oleoresin obtained from Pistacia terebinthus, a variety of which yields the Chian turpentine. According to the Pharmacographia Indica, Vol. I, p. 378, "The general appearance is much the same as that of true mastic, but the color is rather deeper and it wants the fine perfume of the latter article. In the rainy season, unless kept with great care, it runs into a pasty mass."

The two kinds differ in solubility. According to Fielding (Pharmacographia Indica, Vol. I, p. 379), 75 per cent. of true mastic is soluble in hot alcohol, while the Bombay mastic dissolves completely; true mastic and Bombay mastic are completely taken up by hot turpentine, but on cooling the solution of the latter variety gives a precipitate appearing in cauliflower-like masses and amounting to 25 per cent. of the dissolved mastic. Wills ("Vegetable Materia Medica," 1886, p. 72) states that Bombay mastic is soluble in alcohol and this solution is colored brown by ferric chloride.

The chemical composition of mastic is about 1 per cent. of volatile oil, 80 to 90 per cent. of alpha resin and 10 to 20 per cent. of beta resin or masticin. The alpha resin only is soluble in cold alcohol, possesses an acid reaction and is known as mastichic acid. According to Tschirch, mastic belongs to the "resene resins" and consequently would contain no resin esters.

K. Dieterich (*Pharmaceutische Centralhalle*, 1899, 453) has determined the acid numbers of several samples of mastic; Bombay mastic, 137·6, 103·89; Levantine, 65·99; Turkish, 90·56.

The process proposed is to dissolve 1 gramme mastic in 50 c.c. benzine, add 10 c.c. decinormal alcoholic and 10 c.c. decinormal aqueous potassium hydrate solution and put aside for twenty-four hours in a closely stoppered bottle, occasionally shaking. At the end of this time the mixture is titrated with decinormal sulphuric acid, using phenolphtalein as indicator, but adding no water. The difference between 20 and the number of cubic centimetres of decinormal sulphuric acid used multiplied by 28 gives the acid number.

This method was used in the examination of the mastic samples above referred to.

No. 1 was a blank experiment made without the addition of any mastic and required 19·9 c.c. sulphuric acid for neutralization, and this number was used in place of 20 mentioned above.

No. 2 was the white sample referred to in the beginning and required 17·85 c.c. sulphuric acid ; $19{\cdot}9 - 17{\cdot}85 = 2{\cdot}05 \times 28 = 57{\cdot}4$.

No. 3 was of a pale yellowish tint and required 17·4 c.c. sulphuric acid ; $19{\cdot}9 - 17{\cdot}4 = 2{\cdot}5 \times 28 = 70$.

No. 4 was like No. 3 in color, a pale yellow, and required 17·8 c.c. sulphuric acid ; $19{\cdot}9 - 17{\cdot}8 = 2{\cdot}1 \times 28 = 58{\cdot}8$.

No. 5 was of a deep yellow color and required 17·8 c.c. sulphuric acid ; $19{\cdot}9 - 17{\cdot}8 = 2{\cdot}1 \times 28 = 58{\cdot}8$.

These acid numbers are similar to that obtained by Dieterich for Levantine mastic, and the samples behaved with alcohol like true mastic.

THE PRODUCTION OF NITRIC ACID FROM ATMOSPHERIC NITROGEN.

By M. I. Wilbert.

It does not seem to be generally understood that the production of nitric acid and the various nitrates by the combustion of atmospheric nitrogen is one of the immediate possibilities of the future. Text-books on chemistry, when speaking of the chemical properties of nitrogen, usually content themselves by asserting that nitrogen is neither combustible nor is it a supporter of combustion. And while this is true in the ordinary sense of the word, or under ordinary conditions, nevertheless, it has been known for many years that nitrogen is combustible under favorable conditions, and the only reason why we are not enveloped in a sea of nitric acid, instead of a mixture of nitrogen and oxygen, is because the ignition point of nitrogen is higher than the temperature of its flame.

Many attempts at the artificial production of nitrogen compounds have been made, from time to time, and as a result of these experiments it was found that, when hydrogen is burned in oxygen having an admixture of a small quantity of nitrogen, a portion of the latter combines with some of the oxygen to produce one or more of the oxides of nitrogen. It was also found that when atmospheric air in a glass globe, or other confined space, is subjected to a series of electric sparks, red fumes of nitrogen tetroxide were formed. These fumes, in the presence of water, are decomposed with the formation of nitric acid. It was subsequently learned that when the air is compressed the production of red fumes is materially increased.

This combustion of atmospheric air by means of induced currents seems to indicate the solution of the problem, so that even at the present time it would seem possible that nitrogen compounds might be produced economically in this way.

Sir William Crookes, in the presidential address before the British Association for the Advancement of Science, held at Bristol, England, in 1898, referred to this particular problem at some length. He made especial reference to the necessity of the nitrates as fertilizers for the growth of cereals, for which, it is estimated, upward of 2,000,000 tons are used annually. In the course of this address, Sir William Crookes recounts the experiments of Lord Rayleigh, who had tried in various ways to effect the combustion of the nitrogen in atmospheric air for the purpose of separating argon.

From the data furnished by Lord Rayleigh's experiments, Sir William Crookes gives some interesting figures. He estimates that at the present price of coal, with a possible conversion of 10 per cent. of its available energy into electricity, sodium nitrate might be produced at about $130 per ton. If, on the other hand, the initial cost of the electric current could be cut down to one-fifth, as at Niagara Falls, it would reduce the cost of electric sodium nitrate to $26 per ton, and this latter figure, with native nitrate quoted at about $37.50 per ton, would seem to offer a fair margin of profit.

There is even a possibility of improving on these figures. Within a year or two, another source of energy has been suggested that seems destined to play an important part in mechanical and industrial development. This source of energy is derived from the conversion of blast furnace gases into power by means of a new style gas engine that has been introduced at some of the larger

blast furnaces in Europe, especially in Belgium and in Germany. This type of engine was shown at the late Paris Exhibition and seems to have attracted considerable attention. It is claimed by men who have made a study of blast furnace practices that it would be possible to generate a considerable excess of power at these plants as a result of the introduction of this type of engine.

The power generated from this source would necessarily be more or less irregular, so that it could be used to advantage only in the manufacture of some more or less unimportant by-product. It could, for instance, readily be converted into electric energy, and this in turn could be used in the production of various nitrogen compounds, the raw materials for which are always at hand and in unlimited quantities. This available source of energy, with a large and constantly increasing demand for nitrates as fertilizers, would seem to offer considerable inducement for the practical application of a process for the artificial production of nitrogen compounds.

OIL OF WALNUTS (JUGLANS NIGRA, L.).[1]

By Lyman F. Kebler.

Frequent and repeated efforts were made to secure a pure oil of walnuts, with the invariable result that the dealers were either unable to supply it, or oils like the following were sent:

No. 1. *Walnut Oil, White.*—This article was colorless, of a sweetish taste, with a peppermint-like flavor and soluble in water and 92 per cent. and 50 per cent. alcohol. Farther investigation showed it to be diluted glycerin, flavored with a menthol-like body.

No. 2. *Walnut Oil, Conc.*—The word concentrated immediately cast a halo of suspicion about this oil, and on submitting it to a fractional distillation about 80 per cent. came over between 78 and 85° C., which was chiefly ethyl alcohol. Then the thermometer rose rapidly to 205° C., which is the boiling point of nitrobenzene (oil of mirbane) and the odor confirmed the boiling point. A small amount of non-volatile matter was left.

When it is remembered that oil of walnuts is chiefly used by artists for paints, because it dries into a varnish which is less liable to crack than linseed oil varnish, the enormity of such adulterations becomes self-evident.

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[1] Read before the Chemical Section of the Franklin Institute and contributed by the author.

Having been unable to secure an oil of good quality, walnut kernels were secured, ground, and the oil expressed by means of a hydraulic press. In this way 25 per cent. of oil was obtained, while the kernels actually contained 66 per cent. of oil. It was thus deemed of interest to investigate the oil, inasmuch as no such examination seems to have been made.

The oil generally used is that obtained from *Juglans regia*, L., a tree indigenous to Persia and cultivated in Europe and America. The kernels of this nut contain from 30 per cent. to 40 per cent. of "virgin" oil. The fresh cold-drawn oil[1] is limpid, nearly colorless or pale greenish-yellow and of agreeable taste and odor, has a specific gravity of 0·925 to 0·9265 at 15° C., saponification number 186–197, iodine value 142 to 151·7, fusing point of fatty acids 16 to 20° C., dries well and is said to be brought into this country from France and Switzerland in 110-gallon tuns.

Hickory nut oil resembles the above walnut oil very much, and is known as "American Nut Oil."

Wm. T. Brannt (1896, "A Practical Treatise on Vegetable Fats and Oils," Vol. II, 37) says: "Oil of black walnuts is sometimes expressed, but is of little value." On examining the cold pressed black walnut oil, the following physical and chemical constants were obtained: it is limpid, of a straw yellow color, possesses a pleasant, agreeable, walnut-like odor and taste, becomes turbid at — 12° C., has a specific gravity of 0·9215 at 15° C., saponification number 190·1–191·5, acid number 8·6–9, ether number 181·5–182·5, Hehner's number 93·77, Reichart-Missel value 15 c.c., iodine value 141·4–142·7, melting point of fatty acids 0° C.

The drying qualities are excellent, equal, if not superior, in this respect, to linseed oil, leaving a tenacious, flexible, transparent film. An artist, on using it, pronounced it a very satisfactory article for fine painting.

THE WIDE OCCURRENCE OF INDICATORS IN NATURE.[2]

By G. S. Fraps.

In the course of some work on a black cow-pea bean, the writer's attention was attracted by the change from black to red which took place when it came in contact with an acid. Later, in speaking to

[1] "Chemical Analysis of Oils, Fats, Waxes, etc.," by J. Lewkowitsch, 1898 p. 350.

[2] *Amer. Chem. Jour.*, 1900, p. 271.

Mr. G. H. Whiting, a student, about this, he mentioned that the juice of the blackberry had the properties of an indicator. These observations led to the work about to be described. Since completing it, the writer has been informed that a lady placed some violets in ammonia water to preserve them, and to her astonishment they became green.

The results of this work show that indicators are of very common occurrence in nature. Some seventy-four kinds of colored flowers, both wild and cultivated, the leaves of five varieties of coleus, the cow-pea bean, the blackberry, mulberry, smilaxberry, strawberry and the red beet were extracted with water or dilute alcohol, and the extract tested for indicators. In only three cases did the extract not become one color when acid and another color when alkaline. As a rule, the coloring matter was fairly sensitive as an indicator, being changed by from less than one to two drops of tenth-normal ammonia. Some of the changes were very sharp, and many of the colors were very beautiful. In some cases the color passed through several stages in going from acid to alkaline, or the reverse.

The materials examined could be grouped in four classes:

Class I.—Extract not affected by acid or alkali.

Class II.—Extract colorless when acid, yellow when alkaline.

The flowers in this class were yellow, and the yellow coloring matter was hardly affected by the extracting agent.

Class III.—Extract red (or a shade of red) when acid, yellow when alkaline.

Class IV.—Extract red when acid, green when alkaline.

Classes III and IV are not sharply separated, sometimes the color produced by the alkali being such that it was hard to decide whether it was yellow-green or green-yellow. Ammonia was the alkali used; often a green solution with ammonia would have been yellow with caustic soda. Most of the coloring matters in these two classes were very sensitive. In many cases the flowers were bleached when boiled with water, and the extract nearly colorless, or quite so; but it would become colored when made acid or alkaline.

Class V.—Miscellaneous. This includes all that do not fall in the other four classes. It must be observed that in no case do the colors occur in the reverse order from those in the other classes—that is, never colorless when alkaline and yellow acid, or red when alkaline and green or yellow acid.

The colors of the coleus, especially, depend on the degree of acidity of the leaf as well as on the kinds and distribution of the colors. With coleus colors there is a regular change in color from acid to alkaline, or the reverse, passing through several stages. It is easy to see that a slight change in the acidity of the sap of the leaf will affect the color and give rise to some of the manifold variations that are observed in the coleus. The same may be said of some flowers.

METHODS OF EXAMINATION.

Two methods were adopted for testing the color. In the one, small portions of the material were placed into two test-tubes with alcohol, a few drops of fifth-normal hydrochloric acid added to one, of tenth-normal caustic soda to the other, and the changes noted. It usually requires some time for the effect to be visible. In the second method the material was boiled in a large test-tube with about 20 c.c. of water, to which a little alcohol was often added, cooled, the extract poured off, and titrated with fifth-normal acid and tenth-normal ammonia. The two methods usually gave the same results, though they were sometimes different, as was to be expected, as in the one case all of the color, soluble and insoluble, was subjected to the action of caustic soda; in the other case only the soluble part was treated with ammonia. Method 2 allowed some conclusion as to the sensitiveness of the color to be made.

Class I.—Color unaffected by acid or alkali. This includes the orange flowers of *Stylosanthus biflora*, the yellow ones of *Chrysogonum Virginianum*, and the leaves of a smooth, red variety of coleus. Three materials not containing indicators were found out of eighty-one examined.

Class II.—The flowers in this class give a colorless extract which becomes yellow when made alkaline.

The color is moderately sensitive. All of the flowers but one—the white petals of the wild daisy—are yellow or orange. Yellow is a color which cannot be extracted by boiling water. In some cases it goes into solution with the tenth-normal caustic soda.

This class comprises 10; stamens of begonia and *Solanum Carolinense;* petals of canna, *Œnothera sinuata*, *Hypoxis erecta*, buttercups, allamanda, wild daisy, a yellow wild flower, and leaves of the yellow coleus.

Class III.—In this class the materials give extracts which are red or a shade of red when acid, yellow or a shade of yellow when alkaline. All the colors are fairly sensitive, being changed by at least two drops of tenth-normal ammonia. Twenty-one of the 81 materials examined fall into this group, 11 being originally red or pink flowers, 4 orange or yellow, 5 purple or violet, 1 green (coleus leaf). The red and pink flowers were the pink, rose (faint pink, rose and wild rose), pink larkspur, crimson clover, phlox (faint pink, light claret, rose, scarlet, magenta), begonia (2 varieties), double oleander, a variety of *Euphorbia*, *Spensonia goligefolia rosa*, *Clerodendrum* and *Silene Virginica*. With the exception of *Clerodendrum*, which gave a well-colored, orange-pink solution, all of the flowers above named were bleached when boiled with water, giving a colorless or faintly colored solution, which, however, became colored on the addition of acid or ammonia. Verbena flowers gave extracts yellow with caustic soda, but green with ammonia, and the extract from sweet peas, green when first made alkaline, became yellow on standing. These two are included in Class IV.

The purple or violet flowers were the vetch, Mexican sage, heliotrope, *Clematis ochroleuca* and *Solanum Carolinensis*. They were bleached by the boiling. The orange or yellow flowers were orange nasturtium and canna, *Asclepias tuberosa*, yellow *Allamanda vereofolia*. The yellow color of the flower was unaffected, but a colorless or faintly colored extract was formed which became colored on addition of acid or ammonia. A red-orange extract was obtained from the green part of the leaf of a red and green coleus, which was red with acid and brown-yellow with ammonia.

Class IV.—This includes those coloring matters which are a shade of red when acid, a shade of green when alkaline. The greens are at times of a beautiful emerald color, sometimes of a yellowish tinge. Most of the colors are very sensitive to the reagents, being affected by less than one drop of tenth-normal ammonia.

Thirty of the materials examined fall into this class, 15 being originally a shade of red, 9 violet or purple, 3 blue, 1 lilac, 1 black (bean), 1 yellow. The flowers a shade of red were: red clover, scarlet sage, Canterbury bell, red zinnia, rose geranium, crimson honeysuckle, California poppy, verbenas (faint pink and rose), sweet peas (faint pink, rose, maroon, magenta, lavender), gladiolus (rose),

red cyclamen, varieties of *Bumaldæ*, hibiscus, *Tephrosia* (devil's shoestring), and leaves from four varieties of coleus. With the exception of hibiscus, scarlet sage and coleus, the extracts from these were colorless or nearly so.

The purple or violet flowers were phlox, petunia, coriopsis, verbena, sweet peas, "Jimson weed," maypop, or passion flower, *Specularia perfoliata* and *Ruellia ciliosa.*

The lilac flower was *Salvia urtica*, the blue ones were *Ageratum*, *Runella vulgaris* and blue larkspur, the yellow one was nasturtium, and the black material, a cow-pea bean.

The colors from some of these flowers passed through several stages on the way from acidity to alkalinity. The most noteworthy are:

Specularia perfoliata: Magenta, blue, green.

Ruellia ciliata: Rose, lilac, green.

Salvia urtica: Claret, peacock-blue, green.

"Jimson weed:" Magenta, purple, green.

Maypop or passion flower: Magenta, blue, green-blue, olive-green.

Blue larkspur: Magenta, purple, blue, peacock-blue, green.

Purple petunia: Magenta, purple, blue, green.

California poppy: Magenta, purple, violet, peacock-blue, green.

Red coleus: Red, claret, violet, green.

Red and yellow coleus: Rose, brown-red, orange-red, yellow-green, olive-green.

Light red, dark red and green coleus: Cherry, violet, brown, green-brown, dirty green.

Red and deep red coleus: Magenta, purple, blue, green.

Most of the colors above given were very bright and beautiful, and, as a rule, fairly sensitive.

The coloring matters of the following flowers in this group are especially sensitive: "Jimson weed," maypop, *Salvia urtica*, black cow-pea (bean), *Ruellia ciliata.*

Class V.—This group includes substances giving colors with acid and alkali that do not come into the classes already described.

The colors are those produced by ammonia. The color, when acid, is given first, then the stages it passes through to alkaline.

Bougainvillea spectabilis (mauve): Purple, colorless.

Gloxinia hybrida (pink): Pink, purple, brownish-red.

Gloxinia hybrida (purple): Magenta, purple, olive-green.

Dendrobium nobitia (purple): Pink, purple, blue, green.
Amaryllis (red): Cherry, maroon.
Salvia (red): Orange, dark red.
Cynthia (yellow): Yellow, terra-cotta.
Geranium (scarlet): Scarlet, violet.
Gaillardium (red): Scarlet, corn, yellow-brown.
Snapdragon (red): Red, red-brown.
Canna (red): Red, orange-brown.

Fruit:

Smilaxberries (red): Pink, violet.
Beets (red): Magenta, purple.
Strawberries: Straw, purple.
Blackberries: Rose, colorless.
Mulberries: Cherry, violet.
Brown cow-pea bean: Colorless, brown.

Laboratory of the North Carolina College of A. and M. Arts, June, 1900.

CORRESPONDENCE.

PROCTER MEMORIAL.[1]

In response to a letter from the Editor of this Journal concerning the most appropriate way of memorializing the life and work of Professor William Procter, Jr., the following are some of the replies which have been received:

Dear Sir:—Your letter of the 7th inst., requesting an expression of opinion as to the form of memorial to the late Professor Procter I would most favor, has been duly received. It affords me particular pleasure to comply with this request, inasmuch as it brings to mind personal memories of the one whose life and work it is proposed to commemorate, and for the purpose in view I believe that no more fitting opportunity could be found than on the occasion of the fiftieth anniversary of the American Pharmaceutical Association—a body which is not only the national exponent of American pharmacy, but one with which he was so long and so intimately associated.

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[1] For other information and correspondence on this subject, see editorials November, 1900, and February, 1901, and correspondence February and March issues of this Journal.

I am reminded that it is twenty-seven years ago this month since Professor Procter passed away, and as a member of the class before which he delivered his last course of lectures, it may be of interest to mention that as I write from this distant city I have before me, carefully preserved, my student notes of the lecture on pharmacy which he delivered on the eve of his death, dated February 9, 1874. The subject of that lecture was "Animal Substances," and it included the consideration of gelatin, milk, the preparation of lactic acid and lactates, albumen, cod liver oil and pepsin. As Secretary of the Class Society I was also commissioned to convey to the family of Professor Procter the resolutions of sympathy which my fellow-students had adopted on the occasion of his death. The recalling of these incidents after such a considerable lapse of time may serve to explain the special interest which I feel, and which I know to be shared by one of my classmates, Henry S. Wellcome, for many years resident in London, in the success of the project under consideration.

With regard to the form of memorial, it may be well to consider in the first place what Professor Procter would himself have wished, and secondly, what is feasible to accomplish. The work of Professor Procter was, to a large extent, that of a pioneer, and, in my opinion, his memory and the influence he exerted as a teacher and investigator could not be more fittingly and more usefully perpetuated than by the foundation of a scholarship to be known by his name. If a fund sufficiently large for this purpose could be realized, which, unfortunately, is somewhat doubtful, it should be held in trust by the American Pharmaceutical Association, and the interest applied for the higher scientific education at one of the leading American or foreign universities, during a period of at least two years, of such a graduate student of pharmacy as might be found, by a competitive examination conducted by a committee of the Association, properly qualified and otherwise worthy of receiving the specified grant. The value of such a benefaction would naturally not remain confined to the individual recipient of it, but might reasonably be expected to exert the same ever-widening influence on scientific progress as the life and work of the one it serves to commemorate. The details of the conditions by which it would seem desirable that such a scheme should be governed for the attainment of the best results need not be further considered now.

If the plan for a scholarship on sufficiently broad lines is beyond the limits of practicability, I should favor in the second place the suggestion that has already been made by Dr. Fred. Hoffmann in a communication to this JOURNAL (February, 1901, p. 86), namely, the institution of a Procter-Squibb memorial medal, for the reason and the purpose therein stated.

My apologies should, finally, be tendered for having trespassed so largely upon your space. FREDERICK B. POWER.

LONDON, February 25, 1901.

DEAR SIR:—Yours to hand requesting my opinion with regard to the most suitable form of memorial of Professor Procter. I had already read those expressed in your February issue, and think that the most suitable form would be either a scholarship or research laboratory.

A statue will cost at least $15,000, and a further sum would be required to maintain it and its surroundings in good condition. The interest on this sum would be sufficient for a scholarship. My plan would be a travelling scholarship, tenable for, say, two years, open for competition to all graduates of colleges of pharmacy, the award to be made biennially by a committee of the A.Ph.A.

The interest on $15,000 would keep a student at one of the European universities. The scholarship would be a permanent institution perpetuating the name and inciting others to follow in the footsteps of Professor Procter, and the amount of good of which it will be productive is incalculable. Judging from what I have heard and read of Procter's character, the scholarship would be such as he himself would have chosen.

The suggestion of a research laboratory is a good one, perhaps the best yet made, but the question of funds for building and maintenance would have to be solved first. J. E. MORRISON.

DEAR SIR:—It is gratifying to know that a movement for memorializing the life and work of Prof. William Procter, Jr., is likely to take definite shape on such a fitting occasion as the fiftieth anniversary of the American Pharmaceutical Association.

While a number of plans worthy of careful consideration have been suggested, I feel decidedly in favor of establishing a Procter medal, to be awarded for original and worthy pharmaceutical work. I believe that such a memorial will keep alive the true spirit with which Professor Procter worked. H. M. WHELPLEY.

DEAR SIR:—Replying to your recent favor concerning the memorial to Professor Procter, personally I think the best memorial that can be established for any man is a scholarship in the line of study that absorbed his attention. In this instance it might be a two year course of study in a desirable European institution.

E. L. PATCH.

DEAR SIR:—A true memorial serves a double purpose. It honors the man to whom it is dedicated and encourages others to emulate his example and continue his work. The first purpose is best reached by the erection of a monument in a place where the greatest number of his admirers or disciples can see it; the second, however, by some incentive in the shape of a reward for diligence, perseverance or accomplished work. Applying these premises to our case, I would, first of all, erect a monument to William Procter, either a life-size statue or a simple bronze bust, according to the available funds. If the former, it should be put in a public place of Philadelphia; if the latter, in the Philadelphia College of Pharmacy. Contributions for this monument should be solicited from all pharmacists in the United States, so that it would become a truly pharmaceutical tribute to one of our greatest masters.

The second part of the memorial should be undertaken by the American Pharmaceutical Association, of which Procter was a member, and which is the best representative society of American pharmacy. It should consist in a prize for acknowledged prominence in any of the branches of pharmacy, whether as teacher, inventor, manufacturer or practical pharmacist. A medal to be given at stated intervals to the deserving one seems to be the best form of reward, similar to the Hanbury medal of the British Pharmaceutical Conference.

Such a Procter medal, given to the best men of our profession, would be the highest testimonial that American pharmacists could receive and serve to perpetuate the work of the man whose name it bears.

WILLIAM C. ALPERS.

DEAR SIR:—In forms of memorials, as in everything else, I consider that best which contributes most to the advancement and happiness of humanity and least to mere human vanity. Statues and the like will appeal most to those who think least deeply on the

subject. Scholarships, endowments for research and other such measures as will bring forth a constant fruitage of benefit to the race will be the ideals of the far-seeing; but sentimentalists will, perhaps, deem such forms too utilitarian to suit their tastes. If Professor Procter could himself be consulted upon what he would want, I have no doubt but that he would prefer the latter form, without hesitation. The constant suggestiveness of a continuously acting benefit never palls on consciousness but retains for centuries its sweet memories. A cold stone statue enthuses only when fresh and new, after which it is passed heedlessly by like the dead, lifeless thing which it is. Let the American Pharmaceutical Association deliberate upon and decide what kind of memorial will most, and for the longest time, shower benefit upon American pharmacy, and they will soon decide upon an ideal that will satisfy futurity.

R. G. Eccles.

Dear Sir:—In reply to your letter requesting my opinion on the subject of a suitable memorial perpetuating the life and work of Prof. Wm. Procter, permit me to suggest a memorial tablet of bronze, with a reproduction of the bust of Professor Procter and suitable inscription reminding present and future generations of the worth of the man.

No more fitting place for this memorial can be found than in the halls of the institution wherein his achievements were accomplished and of which his work is a corner-stone.

While this form of memorial appears to me most desirable, any suggestion finally adopted by those interested will meet with my most hearty approval. F. G. Ryan.

Dear Sir:—Answering your letter of recent date I would say: Regarding an appropriate celebration of the fiftieth anniversary of the A.Ph.A., and, in that connection, a Procter memorial, I do not believe, from what I knew of William Procter, personally, that a memorial of brass and marble would be in keeping with his practical life and views, however gratifying such a testimonial would be to his many revering friends. I would suggest that a committee be appointed, of which A. E. Ebert and Jos. P. Remington be its chief officers, consisting of a large number selected from the older and the younger pharmacists, to suggest to the Association an appropriate memorial. I, for one, should gladly help to carry out

their recommendations. I have read with much interest what has been said so well by the AMERICAN JOURNAL OF PHARMACY, editorially, and by the correspondents to that journal upon this subject, and am glad that it is being considered.

The revision of the Pharmacopœia has emphasized the fact that we are sadly in need of advanced workmen in pharmaceutical science—men of the Procter type—in different sections of our country. It seems to me that the A.Ph.A. could aid very materially in a practical way if it would take steps toward creating a scholarship substantially as proposed by E. L. Patch.

I referred to this at some length at a meeting of the Association in '95 (see Proc., p. 425–429, '95). After the reading of the paper, Professor Oldberg made a motion that a special committee be appointed to consider the recommendations then made and to report at the next annual meeting on the feasibility of carrying out the recommendations in this paper. That nothing has been done by the Association seems to show, perhaps, that the time is not quite ripe to take up the matter actively. Now that we may soon consider earnestly the question of a Procter memorial, I would again revive this motion, and place it before the committee I suggest. In suggesting a scholarship or fellowship, I am not losing sight of the main point—an appropriate memorial to one in whose memory a lasting monument would be a worthy token—but I am keeping before me the characteristics of him we are striving to respect. He was essentially a practical pharmacist. I do not think he himself would consider long as between an investment in marble or bronze and an endowment of a fellowship as an appropriate expression of a distinguished life such as we may seek to commemorate. In my opinion a monument would be insufficient to memorialize the man and inadequate to carry out what should be the aims of our worthy Association. If I can do anything to further the project under consideration I shall be very glad. L. E. SAYRE.

DEAR SIR:—Accepting the invitation, kindly given by yourself, to take part in the discussion, inaugurated by the AMERICAN JOURNAL OF PHARMACY, relative to "memorializing the life and work of Prof. William Procter, Jr.," one must, at the very outset, ask a series of questions that his right to participate may be assured and his efforts be properly directed.

Entirely pertinent seem the following: Do the pharmacists of the nation wish to preserve, throughout time, the memory of the "Father of advanced, of professional Pharmacy," in a manner that will not only do honor to the subject, but will evidence to the people of this country, even of the world, that there is a real science and profession of Pharmacy and that *Procter* was a most creditable and exemplary exponent of both? Do the friends, followers and, especially, former students of the good man and distinguished teacher wish to possess something entirely of him, his life's history and his writings?

Do the local members of his profession and the citizens of his adopted city and home, where the most of his useful life was lived and where he attained his greatest successes, desire to emphasize the power and influence of such a character and proudly claim him as their own? Or, would the commonwealth and the city, that honor him as their son, and the votaries of pharmacy therein residing, pay tribute to his memory and justly make to him such monument as will show their pride in the sonship and brotherhood which as greatly honors them all?

Two of these questions are purely local and must be answered by the councils of local associations and the representatives of the several bodies interested; another is to a privileged number, to those who were more fortunate than the many who knew him not, but who would, for all, do him honor—thus leaving one, alone, for general consideration. While all four propositions might very properly be answered in the affirmative and be profitably executed, there is no possible doubt but that the first not only should, but must have prompt and fit realization.

At the nation's capital, in artistic bronze, let the form of the nation's son and pharmacy's patron stand throughout the years as a memorial to his worth and a stimulus to his followers.

Very sincerely, Hy. P. Hynson.

Baltimore, February 18, 1901.

Dear Sir:—Having carefully read the memorial paper of Professor Remington, your editorial of November, 1900, and the several suggestions, in the February issue of 1901, regarding the proposed actions of the A.Ph.A. in 1902, and also considered the possibilities and probabilities of success in securing the most useful and abiding

service to pharmacy and properly commemorating the life and work of Prof. William Procter, Jr., I reply to your request of the 5th inst. for my personal opinion.

Among the earliest and most helpful influences to me of the A.Ph.A. was the ever earnest, active work, though always modest, and the genial, lovable character of Professor Procter. I can never forget him, and often recall his approaching me with a list of "queries," with the request that I write in response to one or more. At that time I should have undertaken the task of writing a sermon or lecture upon the creation of the heavens and the earth as to prepare a paper for the Association.

Of all the men I have known in the Association, Professor Procter has and does seem to me to fairly represent what may be termed the "Good Shepherd" of pharmacy.

As I sit in church and see the memorial window to our late rector, representing in the central figure the good shepherd with a lamb in his arms, and in the side panels the four acts of mercy, I have thought how appropriate and serviceable such a memorial would be of Professor Procter, placed in the several colleges of pharmacy, a constant reminder of the "Father of Pharmacy." A life-size representation of Professor Procter, with his hand resting upon a young man, the Pharmacopœia and AMERICAN JOURNAL OF PHARMACY, four or more side panels representing such scenes as could be easily made up from Professor Remington's paper, would surely be an impressive, instructive, helpful and stimulating influence upon every student.

Some such work as this, it seems to me, your College should do at once. Thus, at the meeting in your city in 1902, the A.Ph.A. could properly request the several colleges to follow your example, and for their part, the A.Ph.A. to authorize the preparing of a beautiful Procter memorial certificate, twenty, thirty, fifty or more to be distributed annually to those worthy, recommended by those colleges who had put in the window or done something of the kind, and approved by a special committee or the Council of the A.Ph.A. and indorsed by the Association.

The certificate should be a fine engraving, possibly of your window, accompanied or not by a gold, silver, aluminum or bronze medal. And what a prize it would be!

It seems to me some such plan as this would be a suitable mem-

orial, and accomplish the most good to the greatest number. Such a commemoration of the life and work of one of our early members who has done so much in the Association, and made his life memorable as a leader and teacher in progressive pharmacy, and whose character is a model to follow, would be alike creditable to the memory of Professor Procter and the purpose of the A.Ph.A.

The cost or expense to the several colleges would not be large, and the annual expense to the A.Ph.A. after its first outlay could be easily provided for. It would certainly be national and not sectional, and, as I see it, of constantly increasing service in making exceptional pharmacists. H. M. WHITNEY.

RECENT LITERATURE RELATING TO PHARMACY.

EXAMINATION OF PETROLATUM.

The several characteristics which should be studied in the examination of soft petrolatum are as follows: Color, melting point, behavior under oxidizing agents, stability under heat of 200°, reaction, homogeneity and viscosity. As the melting point estimation is somewhat difficult, by reason of the gradual softening under heat, the best method is to melt the product in a beaker glass, stir with a thermometer until the liquid becomes cloudy and shows first suggestion of thickening, when the thermometer is read. As to oxidation, 3 grammes of the product warmed on water-bath with 10 c.c. acid permanganate solution ($\frac{1}{1000}$) should not decolorize the permanganate, even after ten minutes' heating. If the permanganate is decolorized, rosin oil is to be suspected. The heating to 200° is to detect presence of volatile hydrocarbons which are sometimes irritating; 10 grammes of the product heated five hours in an air-bath should lose not more than 8 per cent. in weight. The reaction of the petrolatum is tested by shaking an ethereal solution with 100 c.c. of water containing a few drops of any acid indicator. The writer prefers iodeosin. The homogeneity of the product is easily proven by examination under the microscope, when no paraffine needles should be noticed. The viscosity estimation is made with special apparatus; suffice it to say that an artificial petrolatum is much less viscous than the natural product. The article closes with a report on the examination of six commercial varieties of petrolatum.—(Dr. M. Hoehnel, *Ph. Zt.*, 1901, 28.) H. V. ARNY.

CINCHONA CULTURE IN INDIA AND JAVA.

Professor Verne, who was sent by the French Minister of Instruction to investigate the cinchona culture, mentions the following interesting facts in his report: The Indian plantations are found about 27° north latitude, 3,600 feet high, in a territory having temperature ranging between 28° and 85° F. The mechanical labor is performed by the natives, who receive from $1 to $1.70 per month, without food, according to age and sex. The favorite species of cinchona is the C. ledgeriana. The plants are raised on mossy ground, sheltered from the winds on one side by a hill and on the other side by thickets of bamboo, the young shoots being particularly susceptible to sudden changes of temperature. By the third year after planting, the tree is sufficiently grown to permit the removal of bark, which grows on again within three years without recourse to mossing operation. The same system is in vogue in Java, where, however, the variety of cinchona is not the English C. ledgeriana (Howard's), but the C. ledgeriana of Moen, the latter being found to yield 9 per cent. of quinine; or, if only the trunk bark about a metre above the ground is chosen, it yields 14 per cent. of quinine. On the other hand, the English C. ledgeriana assays on an average 4 per cent. In Java the cultivation of the latter variety is abandoned; while C. succirubra planting is diminishing. In both the English and Javanese plantations a very large source of profit is the manufacture of quinine on the spot from small and defective pieces of bark, unfit for shipment. Particularly striking is the method of quinine extraction as practiced in Java, it simply consisting of treating the powdered bark with a 5 per cent. solution of caustic soda, heated to 50° C., throwing this mechanically agitated mass into a reservoir containing Java petroleum of specific gravity ·999, removing the petrolic solution of alkaloids by mechanical devices into a warm reservoir, into which is poured water acidulated with sulphuric acid. This watery layer is removed, evaporated and from the concentrated solution the quinine sulphate separates by crystallization, which it is not necessary to recrystallize, since it contains only one-half of 1 per cent. of cinchonine. Of such quinine 50,000 kilogrammes are exported annually to the United States. The special reason of the success of this quinine manufacture is due to the exceedingly clever mechanical devices used in the extraction.—(*J. de Ph. et Ch.*, 1901, page 5.)

H. V. A.

VOLUMETRIC ASSAY OF SALICYLIC ACID.

The following method is suggested as an improvement over processes yet devised. Instead of using bromine acidulated with hydrochloric acid, potassium bromide is employed. This is treated with an exact quantity of sodium hypochlorite solution, titrated to represent in each litre 3·55 grammes of chlorine, 8 grammes of bromine, and 3·45 grammes salicylic acid. This volumetric solution will keep its strength for about a month if kept in a dark place. The details of the assay are as follows: 1 gramme salicylic acid is dissolved in 2 c.c. solution of soda and 50 c.c. water, and the volume brought up to exactly 500 c.c. by addition of distilled water. Twenty-five c.c. of this solution is put into an Erlenmeyer flask of about 375 c.c. capacity. Five c.c. of a 10 per cent. solution of potassium bromide and 10 to 15 drops of hydrochloric acid are added, and to this mixture is poured in drop by drop from a burette the titrated solution of hypochlorite, until one drop communicates a distinct but feeble yellow color to the mixture. To avoid error it is better to have a layer of 5 c.c. chloroform (with sufficient alcohol to prevent emulsification in the mixture) to receive the first suggestion of free bromine. When this yellow is reached, the amount of cubic centimetres of hypochlorite employed is read, and the exact amount of salicylic acid is estimated by multiplying by 3·45. The same method can be utilized for estimation of the salicylic acid, and also for phenol.—(F. Telle, *J. Ph. et Ch.*, 1901, 49.)

H. V. A.

OXIDIZING ACTION OF AMMONIUM PERSULPHATE.

This chemical converts uric acid in the cold to guanine, ammonium allanturate, ammonium oxalate and urea. It changes bilirubine in alkaline solution to biliverdine. It oxidizes hæmatine in ammoniacal solution in the cold, and more rapidly after heating, to a colorless liquid in which is found a precipitate of peroxide of iron. In the same way it attacks diluted blood. These reactions seem to point to the future value of this reagent in physiological examinations.—(L. Hugonenq, *J. de Ph. et Ch.*, 1901, 64.) H. V. A.

DETECTION OF OIL OF SESAME IN OTHER OILS.

A solution of 100 parts of hydrochloric acid to three or four parts of crystallized glucose is prepared. One part of the reagent is put

into a test-tube with two parts of the suspected oil. The mixture is shaken vigorously two or three minutes, heated to boiling, agitated in cork tube and then let stand. If the slightest trace of oil of sesame be present, the liquid assumes a beautiful rose color, passing rapidly to cherry red. The delicacy of the reaction is shown by the fact that the presence of 1 per cent. of oil of sesame brings the coloration within a few minutes, while 10 per cent. caused instant change.—(Tambon, *J. Ph. et Ch.*, 1901, 57.)

H. V. A.

SEPARATION OF PLATINUM METALS.

The platinum ores are roasted, reduced with hydrogen, washed with water, then with dilute hydrochloric acid. This removes alkaline salts and also iron and zinc. The metallic residue treated with twice its weight of sodium chloride, the mixture warmed in a current of dry chlorine at red heat. The volatile products of this reaction being condensed by appropriate apparatus, while the residue, which has been converted into soluble chlorides of the platinum group, is dissolved in water, thus freeing them from the chlorides of silver and lead respectively. To the solution of platinum metals, sodium carbonate and sodium nitrate are added, precipitating all remaining traces of metals foreign to the platinum group, leaving a solution of the double nitrites of sodium and ruthenium, platinum, palladium, iridium and rhodium respectively, while the osmium goes into solution as a sodium chloro-osmite. This solution is treated with caustic soda, then with a current of chlorine and distilled, when the osmium and ruthenium pass over as volatile peroxides (OsO_4 and RuO_4) which are separated by usual methods. The residue in the retort is treated with hydrochloric acid and boiled; sodium nitrite is added and then ammonium chloride, when the iridium and rhodium are precipitated as double nitrites with ammonium, which are insoluble in the presence of sal-ammoniac. The separation of the iridium from the rhodium is accomplished through the differing solubilities of the chloro-sodium compounds. The original liquid now contains platinum and palladium, and the former is separated from the latter by the formation of a chloroplatinate of ammonium, which crystallizes, leaving palladium in the mother liquor, which is removed by precipitation with cyanide of mercury.—(Leidie, *J. Ph. et Ch.*, 1901, 18.)

H. V. A.

VOLUMETRIC METHODS OF THE NEW GERMAN PHARMACOPŒIA.

Of the three methods of volumetric analysis, acidimetry or alkalimetry is employed in the new German standard for the estimation of not only the usual inorganic chemicals, but also in the estimation of such alkaloidal drugs as pomegranate bark, ipecac, aconite, nux vomica and its preparations, belladonna, cinchona, hyoscyamus and their preparations; also for balsam of Peru, balsam of Tolu, copaiba, rosin, wax, cod liver oil and oil of lavender.

The oxidation analysis includes the well-known chemicals such as iron salts, chlorine water and iodine, and through the latter it is applied to the iodine absorption estimation of fats. The precipitation volumetric analysis is directed for the same chemicals as in the U.S.P. and also for the assay of bitter almond water and the mustard oils. Concerning the estimations of the first class, that for the alkaloids is practically the same as in the U.S.P., a possible exception being that "jodeosin" is recommended as an indicator; always, however, with the addition of an ethereal layer. For the cinchona alkaloids, hæmatoxylin is preferred.

The estimation of acid number, ester number, and saponification number of oils and balsams is performed by treating the substance with semi-normal alcoholic potassa titration of excess with semi-normal hydrochloric acid, phenolphtalein being used as indicator. The approximate details of such estimation can be found in literature, notably Proceedings of the American Pharmaceutical Association, so suffice it here to state the following standards are chosen by the German authority:

	Acid Number.	Ester Number.	Saponification Number.
Balsam Peru	—	132·5	224·6
Balsam Tolu	112·3–168·5	22·4–78·4	—
Copaiba	75·6–179·7	—	—
Wax	18·5– 24·1	72·8–75·6	—
Oil lavender	—	84	—
Cod liver oil	—	—	196·6

The iodine absorption of fats is estimated by addition of the fat to an 87 per cent. alcohol containing mercuric chloride and a definite quantity of iodine; the mixture is allowed to stand forty-eight hours and the unabsorbed iodine is estimated by titration with decinormal sodium thiosulphate. Chloroform is added to the mixture for purpose of clearing, this aiding in obtaining accurate

results. One c.c. thiosulphate solution will equal 0·012685 gramme of iodine. The difference between iodine originally employed and the unabsorbed iodine is of course the amount of that element absorbed by the fat, and the number of grammes absorbed by 100 grammes of fat is called the iodine number.—(Dr. Laves, *Ap. Zt.*, 1901, p. 30.) H. V. A.

FERMENTS OF THE LEGUMINOSÆ.

The work of the ferments of sprouting seeds is continued by Bourquelot and Hérissey (*J. Ph. et Ch.*, 1900, 357). They extracted the ferments from sprouting fœnugreek, luzerne and scoparius seed and compared the action of same on starch of caroubier (the seed of Ceratonia siliqua) and on potato starch with that of diastase from malt, finding it totally different.

Diastase hydrolyzes potato starch so completely that the mixture no longer gives the iodine reaction, while the action on caroubier starch is much less than that of the leguminous ferment. The latter ferment, called seminase by the authors, on the other hand, scarcely affects potato starch, but completely hydrolyzes caroubier starch (starch of the horny albumen).

The seminase obtained from the three plants mentioned above is practically identical. Whether it is a single ferment or a mixture is yet to be studied. H. V. A.

ANAGYRINE.

The seeds of Anagyris fœtida, a papilionaceous plant of Southern France and Algeria, contain an alkaloid which was at first thought to be identical with cytisin. This alkaloid is obtained by percolation of seeds with 60 per cent. alcohol containing acetic acid, evaporation of solvent, removal of fat and resin by treatment with water and filtration; precipitation of gum, color, etc., from filtrate with lead acetate; and chloroformic extraction of alkaloid from the alkaline filtrate. Lastly, the chloroformic extract is purified by fractional crystallization of the alkaloids and their platinic chloride and mercuric chloride compounds—this complex method being necessary to separate the real cytisin from the peculiar alkaloid of anagyris—anagyrine. Cytisin is $C_{11}H_{14}N_2O$, anagyrine is $C_{15}H_{22}N_2O$, and in both alkaloids the O atom is neither in a hydroxyl nor in a ketone nor in an aldehyde group.

Cytisin is a secondary base (forming with alkyliodides a tertiary), while anagyrine reacts as a tertiary base.

Comparison of the two formulæ seems to show that anagyrine is butyl cytisin.

However, none of the efforts to convert cytisin into butyl derivatives—several successful!—yielded true cytisin. Anagyrine yields with barium permanganate a peculiar crystalline base, $C_{15}H_{20}N_2O_2$, which appears to be similar to the peroxides of tertiary bases studied by Merling and others. The physiological effect of anagyrine is different from cytisin.—(Dr. F. M. Litteschеid, *Arch. Ph.*, 1900, 191.) H. V. A.

MALARIA AND THE MOSQUITO.

Progress in the investigation of the causation of malaria is proceeding steadily, and definite proof has now been obtained that the bite of a malarious mosquito causes malaria in a non-malarious district, also that if one lives in a malarious district and escapes being bitten by a malarious mosquito perfect health is retained. The latter is the more important fact, and we owe it to Dr. Louis Sambon and Dr. G. C. Low, who, as stated in an illustrated note which we published on July 7, have since May been living in the malaria-infested Campagna of Rome in a mosquito-proof house, and although a month of the experiment has still to run, Professor Grassi, a leading Italian physician, has telegraphed to Dr. Manson, who first formulated the mosquito-malarial theory, that the experimenters are in perfect health and have been all the time, although around them the inhabitants of the Campagna are malaria-stricken. Drs. Sambon and Low have taken no other precaution than that of the protection provided by the house; they have taken no anti-malarial physic, and have breathed the "malaria-stricken exhalations" which constitute the atmosphere of the Campagna. This is ample proof, therefore, that the old "exhalation" theory is wrong, and that we have to seek for the cause of malaria somewhere else. That the mosquito is the infection-carrier there can no longer be any doubt. Members of the Liverpool school who went out to the gold coast and were not bitten by mosquitoes did not take malaria; one member of the party who was bitten had a severe attack of the fever. But that was in a malarious district, and there was wanted by the skeptical proof of malarial infection by the mos-

quito in a non-malarious district. This has now been provided in London by a son of Dr. Manson, who allowed himself to be bitten by a malaria-infected mosquito. For the experiment mosquitoes (*Anopheles*) were raised from the egg in a laboratory, so that they had no opportunity of obtaining the fever parasites, and these were taken to Rome and allowed to suck the blood of patients in whom the parasites of tertian fever were ascertained to be present. The insects were then sent to the London School of Tropical Medicine and fed on vegetable juices until sufficient time had elapsed for the fever-germs to reach their venom-glands. Mr. P. T. Manson was bitten every second day by the insects until they died, usually about ten days after their arrival in London. The first batch was fed in London in the first and second weeks of July, the second at the end of August, and the last during the second week of September. Mr. Manson remained in perfect health until the morning of September 13th, when he was suddenly attacked by headache, boneache, lassitude, and loss of appetite, with rise of temperature to 102° F. On September 15th there was a distinct intermission during the forenoon. High fever, with temperature of 104° F., set in about 4 P.M. with delirium, and was relieved during the night by profuse diaphoresis. The same series of events recurred on September 16th, and on the morning of the 17th tertian parasites were found in his blood. The nature of the illness was verified, and the parasites were seen, not only by Dr. Manson himself, but by other competent observers. The delay in the appearance of symptoms is notable, but is believed to be due either to the condition of the insects or to the need for some lapse of time after the parasites are introduced into the blood before they multiply sufficiently to become effective causes of fever. Mr. Manson is not likely to sustain any permanent injury or inconvenience, as the tertian parasite is not virulent and is easily killed by quinine, which Mr. Manson has taken freely, and there has been no recurrence of the tertian symptoms. These signal proofs of the communicability of malarial fever by insects, and insects alone, once more attracts attention to the need for close study of the various species of mosquito. We are glad, therefore, to observe that the inquiry instituted in 1898 at the suggestion of a committee of the Royal Society by the Colonial Office is bearing fruit. The Governors of all the colonies were requested to have such collections made and sent to the Natural History

Museum, South Kensington, for examination and classification, and as a result considerably over 3,000 specimens of mosquitoes have been received at the museum. The work of identifying and describing the specimens was at first entrusted to Mr. E. E. Austen, the dipterist on the museum staff, but he joined the City Imperial Volunteers as a soldier and naturalist. Mr. F. V. Theobald, one of the few men in England who have studied mosquitoes, has carried on the work in Mr. Austen's absence, and is now engaged in the preparation of a monograph on mosquitoes, based on the collections at the museum. The combined collections contain a large number of species, the majority belonging to the genus *Culex*. Mr. Theobald has completed the genus *Anopheles*, which is the medium by which the malaria-parasite is transmitted from man to man. The genus is represented in the museum by twenty-two species, ten of which are new to science. The *Anopheles*, unlike the *Culex*, does not appear to have a wide distribution in regard to species, although the genus is world-wide. One of the greatest distances between any two localities for the same species is Formosa and the Straits Settlements. A long series sent from the Straits Settlements contained sixty-six *Anopheles* and seventy-two *Culex*. Some species of *Culex* seem to have a very wide distribution. Thus, one species has been sent from Japan, Formosa, Hong Kong, Malay Peninsula, India, South and West Africa, North and South America, West Indies and Gibraltar. The *Culex* is innocent of malarial propensities, so that interest is centered on the *Anopheles*, and the next thing we have to learn after Mr. Theobald has completed his classification is whether all the species are malaria-carriers. The subject is one which pharmacists of an inquiring turn of mind may find it advantageous to follow, and even the enterprising will find it not unprofitable.—(Editorial in *Chem. and Drug.*, 1900, p. 547.)

VEGETABLE ALKALOIDS, DETERMINATION OF, BY MEANS OF THE QUANTITY OF ACID REQUIRED TO FORM NORMAL SALTS.

In previous investigations it has been customary to disregard the theoretical quantity of acid required to combine with the various alkaloids, and a process has generally been considered satisfactory if the end reaction is sharp and concordant results are obtained. This gives considerable trouble in forensic and pharmaceutical work where the quantity of available alkaloid is small and very dilute acid

and alkaline solutions are employed. In this work N/50 sulphuric acid and caustic solutions were employed and the indicator solutions standardized by means of the standard acid or alkali, as required. The alkaloids were dissolved in an excess of the acid, 50 c.c. of this solution added to the standardized aqueous solution of the indicator, and the excess of acid measured by means of the alkaline solution. The following indicators, of the usual strength, were employed: azolithmin, iodo-eosin, methyl-orange, cochineal, phenolphtalein, lacmoid, ethyl-orange, uranine, hæmatoxylin, alkannin and Congo red. The results obtained are summarized in extensive tabulations and the relative efficiency of the indicators is given as follows.

The most suitable are printed in italics; the next best are enclosed in brackets; (*a*) indicates a somewhat indefinite end reaction; (*b*) the indicator is discolored, and (*c*) change of color reaction transitory.

Aconitine.—Iodo-eosin, *azolithmin*, hæmatoxylin, cochineal.

Atropine.—Iodo-eosin, [methyl-orange (*a*)], azolithmin, hæmatoxylin, *lacmoid*, cochineal, *uranine*.

Caffeine.—None are suitable.

Cocaine.—*Lacmoid*, uranine, cochineal, hæmatoxylin.

Codeine.—*Iodo-eosin*, (azolithmin), uranine, hæmatoxylin, cochineal, *lacmoid*.

Coniine.—*Iodo-eosin*, (methyl orange), uranine, [azolithmin (*a*)], hæmatoxylin (*c*), (alkannin), *cochineal*, *lacmoid*, Congo red.

Emetine.—*Iodo-eosin*, [azolithmin (*b*)], [uranine (*a*)], [hæmatoxylin (*a*)], *cochineal*, [*lacmoid* (*b*)].

Morphine.—(Iodo-eosin), *cochineal*, *lacmoid*.

Narceine.—None are suitable.

Narcotine.—(Methyl orange), *lacmoid*.

Papaverine.—*Lacmoid*.

Pelletierine.—(Iodo-eosin), uranine, *cochineal*, [lacmoid (*b*)], [azolithmin (*b*)].

Quinine.—*Azolithmin*, uranine, *hæmatoxylin* (*c*), lacmoid, in presence of ether.

Sparteïne.—Azolithmin, (uranine), *hæmatoxylin*, phenolphtalein, alkannin.

Strychnine.—Iodo-eosin, *azolithmin*, (uranine), hæmatoxylin, cochineal, (lacmoid).

Thebaine.—*Iodo-eosin*, uranine, (hæmatoxylin), *cochineal*, lacmoid (*a*).

Veratrine.—Iodo-eosin, hæmatoxylin, cochineal, *lacmoid.*

The low acid values are due to partial dissociation of the alkaloidal sulphate in aqueous solutions, a part of the acid belonging to the alkaloidal salt being neutralized by the alkali, while the free base separates out or remains dissolved in the colloidal state. In dissociations of this kind the base may not combine with the indicator, because of the relative instability of the indicator-alkaloid compound, which is especially the case if the indicator is a weak acid and the alkaloid is a weak base. Fairly good results may be obtained with a feebly acid indicator and a strongly basic alkaloid; the reverse, however, will not hold good. *High acid values* are generally obtained with methyl and ethyl-orange and Congo red in the titration of quinine and sparteïne. These are due to compounds of the indicator and the alkaloid, formed in solution, which require a considerable excess of acid to decompose.—(C. Kippenberger, *Ztsch. anal. Chem.*, **39**, 201.) L. F. Kebler.

"STRENGTHENING" FLOURS FROM RUSSIA.

Within recent years there have been introduced into France from Russia several brands of flour for the purpose of improving and increasing the value and yield of bread made from flours deficient in gluten. The following results were obtained by Balland (*Comp. rend.*, **131**, 545) on the analyses of three brands:

Constituents.	"Champion."	"Hercules."	"Samson."
Water	9·90	10·70	11 00
Nitrogenous matter	29·48	22·11	16·43
Fatty matter	1·60	1·45	1·20
Amylaceous matter	58·22	64·94	70·65
Cellulose	0·20	0·25	0·27
Ash	0·60	0·55	0·45
Gluten, moist	82·80	64·50	46·40
Gluten, dry	29·10	22·00	16·00
Total nitrogen	4·717	3·537	2·628
Acidity	0·073	0·065	0·065

The above analyses indicate that these "strengthening flours" are simply mixtures of wheat and gluten flours. Their addition to over-bolted flours is undoubtedly valuable, in that it makes good

the deficiency of nitrogenous matter, but they will not raise the per cent. of phosphates, and the apparent increase in yield of bread is purely fictitious, being due to the additional water absorbed by the dried gluten. L. F. K.

SPURIOUS VENETIAN TURPENTINE.

G. Fabris (*Annali del Laboratorio Chimico Centrale delle Gabelle*, 1900, **4**, 143, from *Jour. Soc. Chem. Ind.*, **19**, 768).

Spurious Venetian turpentine, consisting of mixtures of rosin oil, colophony and oil of turpentine, have for some time past found their way into commerce, their color and consistency depending on the relative proportions of the several constituents. In general, such products are very thick and have a mingled odor of their component products. They are completely soluble in 95 per cent. alcohol, have acid value from 105 to 113·8; saponification number 113·6 to 119·2, and from 6 to 13 per cent. distils below 250° C. From these figures the following deductions as to composition are made: turpentine, 6 to 13 per cent.; colophony, 65·2 to 67·9 per cent.; and rosin oil, by difference, 19·1 to 28·8 per cent.

There is some possibility of confusing the genuine Larch or Venetian with these spurious products, yet there are several distinct differences. The Venetian turpentine invariably contains more than 15 per cent. of oil of turpentine, the acid value varies from 65 to 75, and the saponification number from 110 to 125.

The rosin oil can be detected by dissolving 5 grammes of the sample in 20 c.c. of 95 per cent. alcohol, adding a few drops of phenolphtalein and sufficient of a 10 per cent. solution of potassium hydroxide to render alkaline. In case of genuine Venetian turpentine a clear solution results, while the solution of an artificial product becomes turbid, and, on standing, oily drops of rosin oil separate. L. F. K.

ALBUMIN MANUFACTURE IN CHINA.

In the *Chamber of Commerce J.* (Nov., 1900, p. 225) it is stated that the albumin industry established at Hankow lately has made substantial progress. The white of the egg is employed in numerous industries, but is principally employed in the manufacture of leather. All kinds of eggs are employed in the manufacture of albumin, but ducks' eggs are richest in white and, therefore, most in demand. The eggs

are broken, the white separated from the yolk, the latter poured into gigantic reservoirs, mixed with salt to prevent fermentation, thoroughly agitated, and shipped in barrels. The egg white is exposed to the air in open casks, in well-heated rooms, until it attains a certain degree of fermentation. Then it is drawn off by means of taps, placed into small open zinc vessels and allowed to stand some time; subsequently it is dried at a higher temperature, which transforms the egg albumin into dry friable cakes. In this form the article is packed into cases and shipped. At present five firms are engaged in this industry, three German, one Austrian and one French, who work up, in the aggregate, from 300,000 to 310,000 eggs daily.

L. F. K.

PHENYL-ETHYL ALCOHOL IN ROSE BLOSSOMS.

Ordinary rose oil as usually made never possesses the true odor of the rose. Many attempts have been made to obtain the true natural odor of the rose by means of the volatile solvents. It was found by H. Walbaum (*Ber.*, 1900, **33**, 2299) that an oil obtained in this way from the fresh leaves consisted for the greater part of phenyl-ethyl alcohol, while geraniol is the principal constituent of oil distilled with water, from fresh leaves. On extracting 90 kilos of the dried rose leaves by means of ether, distilling the extract in steam, then shaking the distillate with ether and evaporating the ethereal solution, there was left a brown oil which consisted for the most part of phenyl-ethyl alcohol. See also *Ber.*, 1900, **33**, 1720, and *Chemist-and Druggist*, 1900, **56**, 961. L. F. K.

ROSE OIL, GERMAN.

It has been found that German and Bulgarian rose oils consist essentially of geraniol and odorless hydrocarbons (Bertram and Gildemeister, *Jour. prakt. Chem.*, 1894, **49**, 185). Tiemann and Schmidt (*Ber.*, **29**, 923) also found citronellol in Bulgarian oil. Mixtures of the above do not possess the odor of rose oil, consequently there must be other odoriferous constituents present. H. Walbaum and K. Stephan (*Ber.*, 1900, **33**, 2302) determined to investigate this matter and for this purpose carefully fractionated, partly by steam and partly under diminished pressure, 11 kilos of German rose oil and examined the several fractions. This investi-

gation has established the presence of the following new constituents in German rose oil: normal nonylic aldehyde, citral, *l*-linalool, normal phenyl-ethyl alcohol and *l*-citronellol. It should be noted also that there were indications of other constituents in this oil. The pertinent observation is made that an explanation is lacking for the presence of only a trace of the phenyl-ethyl alcohol in ordinary rose oils and the large quantities of the same alcohol in extracted oils. L. F. K.

PREPARATION OF TERPIN HYDRATE.

Keutmann (*Pharm. Ztg.*, **43**, 296) finds that on mixing one part of hydrogen peroxide (per cent. ?), two parts of nitric acid and eight parts of oil of turpentine, then allowing the mixture to stand a few hours, a copious crop of terpin hydrate crystals will be formed. L. F. K.

THE PREPARATION OF AN EXACT STANDARD ACID.

C. Longuet Higgins (*Journ. Soc. Chem. Ind.*, **19**, 958) reviews the subject in a very satisfactory manner, and the reader is referred to the original communication for details. The method worked out by this author is similar to the one first presented by Mr. G. T. Moody, 1898, *Jour. Chem. Soc.*, **73**, 658, and consists in dissolving a given weight of pure dry hydrochloric acid in a definite weight of water. L. F. K.

CONSTITUENTS OF WEST INDIAN SANDALWOOD OIL.

Hugo von Soden and Wilhelm Rojahn (*Chem. Centr.*, 1900, 1274; *Pharm. Zeit.*, 1900, p. 878) separate amyrol into components. Of these the alcohol $C_{15}H_{25}OH$ is present in larger proportion, possesses boiling point, 299°; specific gravity, 0·987 at 15°, and a rotation of + 36°. The second alcohol appears to have the composition $C_{15}H_{23}.OH$ and to be optically inactive.

From West Indian sandalwood oil, 0·1 per cent. of amyrolin, $C_{14}H_{12}O_3$, has been isolated; it crystallizes from methyl alcohol in stout crystals, is colorless, odorless and tasteless; melts at 117°; dissolves in hot alcohol, giving the solution a blue fluorescence and in alcoholic potash solutions with a yellowish-green fluorescence. Amyrolin appears to be an aromatic compound of the character of a lactone.

PHARMACY LAWS AND LEGISLATION.

CONTRIBUTED BY PROFESSOR J. H. BEAL, SCIO, O.

Under this title it is designed to give each month a brief *résumé* of proposed and accomplished pharmacy legislation, and of decisions of importance to pharmacy boards and pharmacists. On account of space limitations, proposed legislation cannot be more than briefly mentioned, but bills enacted into law will be discussed and their principal features pointed out. Pharmacy boards and members of legislative committees and others are requested to send copies of such measures and news of this kind either to the editor of this JOURNAL or to Prof. J. H. Beal, Scio, O.

MINNESOTA STATE BOARD OF PHARMACY REPORT.

The citizens of Minnesota are fortunate in having a fairly good pharmacy statute, and a Board of Pharmacy that is more than fairly good, in fact one of the most efficient boards in the United States, the sixteenth annual report of which is a model of what pharmacy board reports should be.

The report shows 591 pharmacists enrolled on experience at the time the law was passed, 714 pharmacists enrolled by examination, and 169 assistant pharmacists.

During the year the board conducted forty-one prosecutions to a successful issue. Thirty-eight were for failure to keep a registered pharmacist in charge of the store, the fine being $50 in each case. Two were for failure to expose certificate of registration, with a fine of $10 each. In one case, cause of complaint not stated, the fine assessed was $150. The total of fines assessed was thus $2,070, which, with the costs added, shows it to be rather expensive to violate the pharmacy law in Minnesota.

The report also contains the minutes of the several meetings of the board for the year, the lists of questions asked, and an illustration showing the portable dispensing cabinets used in examining students in compounding and prescription work.

The finances of the board are in flourishing condition, the cash balance on hand at the close of 1900 being nearly twice that at the end of the preceding year.

NEW YORK.

Proposed pharmacy legislation is a live topic in New York State at present, a number of measures affecting pharmacy having been already introduced into the legislature.

Prior to the last session of the legislature, New York was afflicted with four distinct pharmacy laws, one for Erie County, one for Kings County, one for New York City, and one for the remainder of the State. After many futile efforts, the pharmacists of that State succeeded in procuring the enactment of a statute covering the entire State, and repealing the old ones.

It was not to be expected that a measure which attempted to reconcile so many conflicting interests could be permanently satisfactory, nor indeed was this the result. The present measure, while in many respects an improvement over the old condition of four separate laws and boards of pharmacy, still leaves much to be desired, and the present agitation must be expected to continue until either an entirely new measure has been enacted or until the present law has been amended into a more satisfactory shape.

Among the more important of the measures introduced up to date are the following:

The Donnelly Bill seeks to amend the law so as to permit all licensed druggists of the eastern section to participate in the election of the members of the board for that section, and also provides that registered assistants may become licensed druggists upon filing an affidavit as to the possession of the necessary experience; that the surplus left after paying the expenses of the board shall be paid into the State Treasury; authorizes the State Controller to examine the books of the board, etc.

The Costello Bill aims to amend the law by extending the lists of drugs which may be sold by country merchants, and requires the board of pharmacy to issue permits to compound medicines, fill prescriptions and sell poisons, to such retail dealers in general merchandise as shall satisfy the Board of Pharmacy as to their competency for such purposes.

The Weeks Bill makes it "a misdemeanor for any person, firm or corporation to sell or offer for sale any adulterated or altered drug, medicine, pharmaceutical preparation or chemical substance," under a penalty of not less than $25 nor more than $100 for each offence. The bill is said to be specially aimed at the sellers of adulterated borax.

The Bell Bill is supposed to be aimed at Christian scientists, osteopaths and similar fakirs, and enlarges the definition of what shall be considered as the practice of medicine, so that "Any per-

son shall be regarded as practicing medicine within the meaning of this act who shall profess to heal or who shall give treatment to any other person by the use of any remedy, agent or method whatsoever, whether with or without the use of any medicine, drug, instrument or other appliance, for the relief or cure of any wound, fracture or body injury, infirmity, physical or mental, or other defects or disease. This is not to be construed as prohibiting the manufacture, sale or use of any proprietary or patent medicine where no diagnosis is made by the maker or seller thereof; or the giving of temporary relief in an emergency by a registered pharmacist or any person, or the domestic administration of family remedies."

One of the numerous measures has already been passed, and awaits either the Governor's signature or his veto. This is the "Military Code Bill," and amends the law of 1900 which gave to pharmacists of the National Guard the rank of first lieutenant. The bill is said to have been pushed through the legislature by the surgeons and other officers of the National Guard, who are opposed to admitting pharmacists to rank because of social reasons. Whether this be true or not, the measure is a direct affront to the profession of pharmacy, and it is difficult to see how any self-respecting pharmacist can hereafter accept an appointment in the National Guard of the Empire State.

MASSACHUSETTS.

The Cloutier Bill seeks to amend the present law regulating the granting of liquor licenses to registered druggists by providing that the fact that a druggist has been convicted of a violation of the liquor law shall not operate as a forfeiture of his license, nor permit the pharmacy board to revoke his certificate of registration as a pharmacist.

Among other bills is one to increase druggist's liquor license from $1.00 to $500, one making only one signature necessary in recording sales of liquor, one requiring members of the Board of Pharmacy to be graduates of a college of pharmacy, and one requiring the use of preservatives in food or drink to be stated on the label. Another bill amends the present law against adulterations, and still another prohibits the substitution of one article when another is called for.

MISSOURI.

Bills have been introduced in the Senate and House to amend the present law so that physicians cannot register upon diplomas in medicine.

NEW JERSEY.

The New Jersey Legislature is wrestling with a bill to amend the present pharmacy statute by defining more clearly what shall constitute the unlawful practice of pharmacy, giving the State Board authority to employ counsel, enlarging the scope of examinations, and empowering the Board to employ inspectors for the purpose of detecting violations of the law.

One bill makes it unlawful for any person in the State to refill any bottle, and another prohibits the adulteration of drugs.

PENNSYLVANIA.

In this State bills have been introduced by Senator Snyder and Representative Stubb to amend the pharmacy law by "making additional regulations in regard to the practice of pharmacy, and the sale of medicines and poisons, enlarging and defining the powers of the State Pharmaceutical and Examining Board, and imposing penalties for violation."

The bills, if enacted, will make almost an entirely new pharmacy law for the State.

REPEAL OF THE STAMP TAX.

It is estimated that the repeal of the special tax on proprietary medicines will save $4,000,000 annually to the drug trade of the United States. The law takes effect July 1st, until when medicines must bear the same stamps as heretofore. The fact that the repeal was forced in the face of the most determined opposition is a striking evidence of the force which the pharmaceutical profession of the United States is capable of exerting when working with any approach to unanimity.

EDITORIAL.

PHARMACEUTICAL JURISPRUDENCE.

At the Montreal meeting of the American Pharmaceutical Association, Joseph Jacobs proposed (see Proc., 1896, p. 347) that measures

be taken by the Association to insure an exhaustive and accurate compilation of every law and every legal decision that bears upon the practice of pharmacy and the relation of the pharmacist to the public, the physician and State. He further suggested that this be recorded under the title of "Laws and Comments" and kept separate from other matters pertaining to education. His idea was the establishment of a department on Progress in Pharmaceutical Jurisprudence, similar to the department on Progress in Pharmacy. Others since that time have also referred to this need.

The reports of the Secretary of the Section on Education and Legislation of the A.Ph.A. must necessarily be more or less in the nature of statistics, as the office is seldom held by any one person for more than two years, and just about the time that he is competent to make a digest of such an important question his office is turned over to his successor, who again must serve an apprenticeship as his predecessors have done. These statistics are no doubt of value, and yet it was evidenced in the discussion at the last meeting (see Proc., 1900, pp. 283, 284) that there may be errors in the compilation owing to complications in the reports received from the secretaries of the various boards, and like many other statistics may really not give the information that is in accord with the facts. It therefore seems that what is most needed at the present time, when the pharmacists of the country are being roused to an appreciation of the value and power of organization and the possibilities of its effect upon legislation, is that some one who is competent for such a work shall present from time to time, as may be deemed necessary, a succinct account of the progress in Pharmaceutical Jurisprudence, this report to include amendments of old statutes and the enactments of new ones as they are made, and the recording of various court decisions of a nature affecting pharmacy, and all other matters relating to pharmacy laws and legislation; also a discussion of bills which are likely to be modified in their passage, if passed at all, and the criticism of individual statutes after they are enacted into laws.

The editorial management of the AMERICAN JOURNAL OF PHARMACY has not heretofore devoted much space to the matter of Pharmaceutical Jurisprudence, because the subject is one requiring the direction of an expert of unusual ability and training. It must be conceded that unless such a work, as outlined, is accomplished by an authority much harm can be done a cause requiring a strong hand for its

successful direction. The excellent work that has been done during the last five years in the American Pharmaceutical Association has been crystallized out largely under the direction of Prof. J. H. Beal, Scio, O. Beginning with his paper (Proc., 1896, p. 319) on "A Comparative Exhibit of Pharmacy Laws in the United States," and extending to his "Draft of a Model Pharmacy Law" (Proc., 1900, p. 284), Professor Beal has shown a remarkable grasp of the situation and has come as one whose influence is universally conceded to be beneficent to the cause of pharmacy legislation. Professor Beal has had an experience as a retail pharmacist, a training in law, a familiarity with the different methods of education, and a wide personal experience in securing legislative enactments, all of which qualify him to do just such work as is needed at this time to benefit the public, the State, the physician and the pharmacist.

It is with pleasure that we announce that Professor Beal has consented to present from time to time, as may seem necessary, to our readers a critical survey of the present status of pharmaceutical laws and legislation. It is particularly desirable that the secretaries of the various State Boards, the chairmen of the various committees appointed by local, State or national associations to consider new pharmacy laws or amendments to old pharmacy laws and that others who can in any way contribute in correspondence or in any other way, address Professor Beal or the editor of this JOURNAL, in order that nothing of importance shall fail to be recorded and that the pharmacists of the different States may profit by the actions of the others. As Professor Beal said (Proc., 1896, p. 345) on another occasion, "The existence in forty States of as many different laws of the same subject will yield approximately the same volume of experience in one year that could be gained in forty years with one legislative body. Moreover, it enables us to compare the merits of different enactments working side by side, under nearly the same conditions."

PHARMACEUTICAL MEETING.

The sixth of the series of pharmaceutical meetings of the Philadelphia College of Pharmacy for 1900–1901 was held on Tuesday, March 19, 1901. Prof. Samuel P. Sadtler presided. The meeting was one of the most successful of the year in attendance and interest manifested in the various matters presented.

Prof. Virgil Coblentz, of the College of Pharmacy of the city of New York, who is well known as a writer, teacher and expert in pharmaceutical and industrial chemistry, presented a paper on "Recent Developments in the Study of the Relationship between Chemical Constitution and Physiological Action of Organic Compounds." The speaker said that there is a close relationship between chemical constitution and physiological action, as shown by the fact that certain changes in chemical structure or constitution cause like changes in the physiological action of similar bodies; and, furthermore, that the addition of certain groups to compounds of different action produces bodies of similar physiological action, or are alike rendered inactive. (1) The methylating of different alkaloids of different physiologic action produces compounds which paralyze all the motoric nerve terminals like curarin. (2) The introduction of the carboxyl or the sulphonic acid groups into bodies of well-defined toxic properties results in a marked diminution or total destruction of their action, as, for example, morphine sulphonic acid in dose of 5 grammes is harmless. (3) Bodies containing a tertiary nitrogen, and possessing slight or no toxic properties, become very poisonous through reduction and formation of an imido group. Thus pyridin is more toxic than collidin. (4) The introduction of hydroxyl groups into aliphatic bodies modifies their action, this decreasing with their increase in number. Thus the presence of this group in caffeine destroys its effect. The influence of the hydroxyl group is observed in the various derivatives of morphine, as codeine, dionin, peronin and heroin. (5) The replacement of a hydroxyl by an alkyl rest renders the entire body chemically and pharmacologically more resistant to oxidation in the system. Thus the introduction of an oxyethyl group into caffeine gives the latter an additional narcotic action. (6) The introduction of chlorin into aliphatic compounds produces bodies of a more or less narcotic action, whereas, if the substituted body belongs to the aromatic series, active antiseptics result. (7) Iodine imparts to all bodies of both series strong antiseptic properties. (8) The researches of Loew seem to show that bodies with a double linkage are more toxic than the corresponding saturated ones.

In referring to the relationship between taste and chemical constitution, Professor Coblentz said that the hydroxyl and amido groups are taste generators, and that the presence of a carboxyl group produces in all cases a sour taste. The natural glucosides are bitter,

because they are mostly phenol derivatives. Disagreeable tastes are remedied usually by the conversion of the substance into an insoluble compound, which is then split up by the secretions in the intestinal canal.

The author, in closing, referred to the intestinal antiseptics, antipyretics, anæsthetics and proprietary combinations. The paper will be published in full in a later issue of this JOURNAL.

In the discussion which followed, Professor Sadtler said that if it were so easy as Professor Coblentz had indicated to make the compound desired, it would help to clear up such questions in litigation as involved the question whether or not the product is an invention. In reply to Wallace Procter as to whether the processes are not intricate, Professor Coblentz said that in some cases the process is exceedingly simple, as in the production of cocaine from ecgonine, whereas in others it is difficult. He further said that many compounds which readily break up in a test-tube do not on a manufacturing scale, and *vice versa.* The results which will be obtained cannot always be determined in advance. He said that there was a great amount of difficulty in this country to carry on this kind of work, and that there were a number of reasons why such work could be carried on more advantageously abroad than here; for one thing tax-free alcohol offers advantages to foreign manufacturers; also they are willing to employ from 50 to 100 chemists; to wait for results; and are satisfied with negative as well as positive results; the former being not infrequently more valuable to them than the latter.

Mr. M. I. Wilbert said that he had found difficulty in preparing sterilized solutions of cocaine and at the same time preventing their hydrolysis. Mr. Gordon said that inasmuch as distilled water was slightly alkaline, he had prepared sterile cocaine solutions with slightly acidified distilled water. Dr. Wendell Reber said that as a local anæsthetic to mucous membranes eucaine B deservedly holds a high place, and is widely used. Moreover, the recent experience of surgeons has demonstrated its almost perfect adaptability to the production of complete insensibility of the body below the waist line by injection of its solutions into the spinal column. He wished that Dr. Coblentz had said something about the synthesis of holocain and its relation to the rest of these synthetics. To the eye surgeon holocain is the nearest approach, so far, to the ideal local anæsthetic for

four reasons: (1) Its solutions may be boiled and remain stable (a point of immeasurable superiority over cocaine). (2) It is cheaper than cocaine. (3) It produces practically no dilatation of the pupil. (4) It does not loosen the epithelium with which the front surface of the eye (the cornea) is paved as does cocaine; and, finally (5), its point of greatest superiority, it possesses distinctly antiseptic properties, and is therefore also its own preservative when in solution. This renders it an ideal agent for the after-treatment of cinders and other non-penetrating foreign bodies in the eye. Its one disadvantage is that because of its extreme toxicity when internally used, it cannot be introduced under the skin or into the cavity of the spinal column, as can cocaine and eucaine B. For such purposes it is distinctly inferior to cocaine, and especially in spinal puncture to eucaine B.

Mr. F. W. E. Stedem said that in his work in urinalysis he had experienced considerable trouble in determining sugar when the patient had been taking various of the synthetics. Professor Coblentz commended the phenylhydrazine test for the detection of sugar in urine where the newer synthetics had been administered. Mr. F. T. Gordon employs the customary fermentation test. Professor Moerk said that there were several works in which the authors treated of the influence of synthetics on the usual tests employed in such work. Dr. E. Spaeth in his work considers a large number of synthetics, with means for detecting them in urine.

Professor Kraemer referred to the important work which is being developed in this country by both plant and animal physiologists in showing the relationship between the radicals, or especially *ions*, of certain chemical compounds in solution to plant and animal functions; and said that Dr. Jacques Loeb had recently shown, for instance, that there could be no heart beat unless sodium ions were present, and on this basis had shown the value of sodium chloride solutions in prolonging and saving life. He has even gone further and shown the important role that potassium and magnesium ions play in carrying on certain fundamental life processes.

Mr. Lyman F. Kebler presented a paper on "The Physical and Chemical Examinations of Oils of Sandalwood, Lavender and Thyme," in which he stated that the amount of some one important constituent was of more significance than physical tests. This paper will be published in full in a later issue of this JOURNAL.

Professor Coblentz said that in an examination that he had made of oils of bergamot and lavender he had found no relationship to exist between the ester content and aroma; in fact the inverse ratio seemed to hold. He said that perfumers judged these oils by odor and had not found the chemical tests to check the results based on odor; that the Italians were particularly adept in raising the ester value of these oils without increasing their aroma.

In the absence of the donor, Professor Sadtler exhibited a jar which had been presented to the College by Mr. Howard B. French, and which was used formerly in transporting olive oil across the Egyptian deserts on the backs of camels. It was interesting on account of it being a kind of container that is seldom, if ever, seen at the present time.

Mr. W. E. Ridenour presented a specimen of a bezoar, which was taken from the stomach of a Texas steer. Mr. Wiegand presented, in behalf of W. C. Wescott, Atlantic City, a decimal platform scale.

An interesting note was furnished by Mr. W. E. Ridenour on the value of the carat as expressed in the metric system. He said that some time ago he was called upon to weigh a diamond and to state the weight in jeweler's terms, carats and fractions. It was necessary to find the equivalent in the metric system, as his weights were of the latter, and in looking the matter up found the following clipping from the *Mining and Scientific Press*, October 27, 1900: "The weight by which diamonds and precious stones are calculated is: 4 grains = 1 carat; 157½ carats = 1 ounce, Troy. A fine diamond, perfectly white and pure, weighing 1 carat is worth $100; 2 carats, $400; 4 carats, $1,100; 5 carats, $1,750."

The diamond weighed ·327 gramme, and according to the above data he reported its weight to be 1¼ carats. His report was made in the presence of the diamond salesman, who became indignant, as he had claimed the weight to be 1 carat $\frac{1}{2}$ — $\frac{1}{16}$ and $\frac{1}{32}$. The diamond was subsequently taken to several jewelers and the weight of 1 carat $\frac{1}{2}$ — $\frac{1}{16}$ and $\frac{1}{32}$ was verified in each case. Mr. Ridenour then weighed several 1 carat weights and found them all to weigh ·205 gramme, being ·055 gramme lighter than stated in the *Mining and Scientific Press*. This was subsequently confirmed by Mr. Henry Troemner, Philadelphia; so therefore 1 carat = ·205 gramme = $3\frac{2}{13}$ grains.

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